Questions and Answers for N00173-02-R-AT02:
ELECTRON BEAM THIN FILM EVAPORATION SYSTEM WITH IN-SITU ANGLED EVAPORATION CONTROL

1. In reading through your specifications, the vacuum system controller has me a little confused. What is the Granville-Phillips digital gauge control that you are looking for. Is there a particular PLC that you are looking for? This appears to be a Granville-Phillips type 303 with manual control? The GP 303 is no longer offered.

   Answer: The vacuum system controller should include an integrated unit designed for Granville-Phillips type digital gauges or equivalent digital gauges. (It is internally a programmable logic circuit (PLC) with minimum 12 outputs, 3 of which are user-definable, and has a diagrammatic front panel with lamps and switches and full manual control behind the front panel for troubleshooting and maintenance.)

2. The general description with the synopsis is clear on what the system is required to achieve, but further clarification on how the primary substrate holder is to look and perform would be very helpful. For example, is there or can a sketch or drawing be provided on how the substrate holder should look and/or operate?

   Answer: There is no sketch or drawing of the substrate holder.

3. When the primary substrate holder is set at a given angle from zero (0) degrees (parallel with the chamber base plate) or at ninety (90) degrees (vertical to the base plate) or any other set angle, should the substrate holder rotate and orbit around the circumference of the chamber wall, or should the primary substrate holder "pivot around" at the center of the chamber as the holder rotates?

   Answer: The capability to rotate the substrate holder respect to the axis that is orthogonal to the substrate holder at specific tilt angle.

4. As we understand the specification, the substrate rotation system (with the primary rotation fixture attached) is required to make one (1) full rotation then reverse. Is this so that the Liquid Nitrogen (LN2) line does not get tangled or is this required for the film process?

   Answer: This is the case of a deposition while the substrate holder is rotating continuously. The direction of rotation needs to be reversed to avoid the tangling of the liquid nitrogen lines attached to the substrate holder.

5. The primary substrate holder is required to tilt (or flip) 180 degrees. Is this so both sides of the substrate can be coated with the required film process?

   Answer: Both sides of the substrate need to be coated without reloading the substrate.

6. Regarding the secondary substrate holders, the specification is requesting three (3) separate 18 inch diameter domes which will hold twelve (12) 3 inch wafers, is this correct?

   Answer: This is correct.

7. Although the substrate holder is made of stainless steel, should the heat sinks be made of a different material such as Aluminum for better heat conductivity?

   Answer: Aluminum will be a preferable heat sink material where the substrate contacts the holder. Copper will not be acceptable as a heat sink material.

8. Can a sketch or drawing be provided to illustrate how the wafer would attach to the substrate?

   Answer: No.

9. We offer a special substrate/heat sink holder system which would operate a little differently than the system specifications calls for. May we offer it as an option?

   Answer: Yes.

10. Is 90 day delivery a requirement or a desire?

    Answer: 90 day delivery is desired. Required delivery is 120 days after contract award.

11. Is a front opening chamber as opposed to a bell jar acceptable?

    Answer: A front opening chamber is acceptable as long as it meets the minimum requirements listed in the specifications

12. Cryo pump base pressure is only attainable with the pump blanked off on a test stand. No pump manufacturer will accept that base under any other conditions.

    Answer: System base pressure should be better than $1x10^{-7}$ and pump base pressure should be $1x10^{-10}$ by pump itself.

16. Vent time under 5 minutes will only be possible once the cryo work holder has risen to ambient. Other wise it will condense moisture excessively.

    Answer: 5 minutes from the acceptable condition of venting the chamber along with a Nitrogen back filling. The acceptable condition means that the condition will not cause excessive moisture condensation in the chamber.

17. Clarify no hardware modifications. The two work holders cannot be in the chamber at the same time. Some form of interior modifications will be required.

Answer: The primary and secondary holders can be interchanged by removing the top plate of the chamber without removing any parts of the substrate holders. The detaching of the connections from the outside of the top plate will be necessary.

18. Regarding the primary substrate holder: This is confusing. Further define the rotation. particularly vertical which would indicate a side drive mechanism. We believe is should read rotates 360 horizontally about the central vertical axis. What is meant by the angle that it should rotate to? Is this an index to a specific angle then stop? This implies a stationary deposition Rotation reverses to what? Ability to tilt 0-180. Is this going to be a static deposition? It is the only thing that makes any sense if the 0-180 is correct. Tilt adjustable. Manual or automatic adjustment. Cool should read from ambient to 77K. Heat possible if holder is not loaded with LN2

Answer: The rotation axis will be the axis that is orthogonal to the substrate holder at a specific tilt angle. Capability of mounting samples at pre set angle and ability to rotate sample holder to about a fixed axis. This is the case of a deposition while the substrate holder is rotating continuously. The direction of rotation need to be reversed to avoid the tangling of the liquid nitrogen lines attached to the substrate holder. Manual tilt control to an indexed specific angle under vacuum will be acceptable.

19. Regarding the secondary holder: Is this a Knudsen fixture with both front and back load capability?

Answer: A Knudsen type fixture will be acceptable as a secondary holder.

20. Regarding the instrumentation: The system will be a touch panel interface to a PLC. Will that be acceptable?

Answer: A touch panel interface to a PLC is acceptable.

21. May a rectangular chamber with full access door be used in place of the Bell Jar?

Answer: A front opening chamber is acceptable as long as it meets the minimum requirements listed in the specifications.

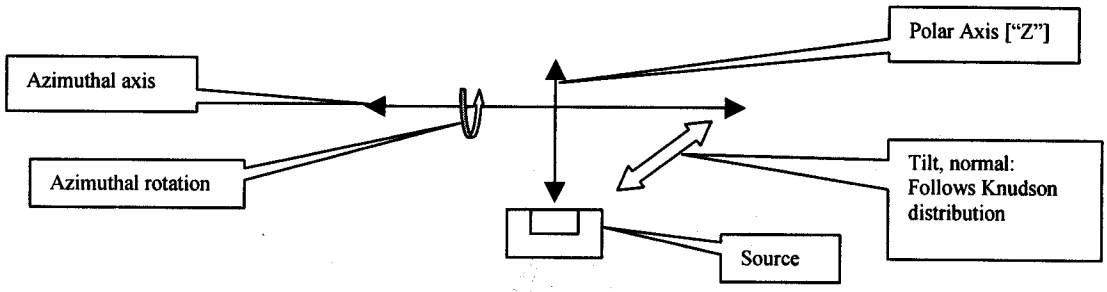
22. May "Field Type" pressure gages be used? [EX: Mini Convectron]

Answer: "Field Type" pressure gauges with the capability of read out and control through the computer interface is acceptable.

23. Since ISE uses a computer for control, Is it acceptable to provide user defined I/O to replace the Granville-Phillips [Helix] controller I/O?

Answer: The user definable computer I/O is acceptable.

24. I would like to clarify the "Primary Holder" requirement for "tilt".
    i) Are you looking for Tilt of the Azimuthal axis about it's axis [Azimuthal rotation], or Tilt of the Azimuthal axis with respect to the Polar axis [Tilt, normal]. Please see Below:



Answer: Capability to tilt the substrate holder to an indexed specific angle respect to Polar Axis (Z axis) along with the capability to rotate the substrate holder respect to the axis that is orthogonal to the substrate holder at specific tilt angle.